

ErgoTek, Inc.

Ergonomics
Human Factors Engineering
Safety

Thursday, May 15, 2008

Scott A. Barbour, Esq.
McNamee, Lochner, Titus & Williams, P.C.
677 Broadway, PO Box 459
Albany, New York 12201-0459
barbour@mltw.com

Re: Duhart v. CSX

Dear Mr. Barbour:

This report summarizes my review, analysis and findings regarding the biomechanical exposures, ergonomic hazards, and general safety hazards associated with the operation of replacing the oil lube cooler for an SD40 EMD locomotive at the CSX Selkirk, NY facility. This is the operation that Mr. Duhart feels is responsible for development of his low back pain that developed on May 14, 2005.

I am a faculty member of West Virginia University's College of Engineering and direct the National Institutes of Occupational Safety and Health's Occupational Safety and Health Engineering Program and have provided a copy of my curriculum vitae for review. I am well educated and highly experienced within the field of safety engineering, ergonomics, human physiology and anatomy, occupational biomechanics (particularly in low back biomechanics and injury risk potential), safety engineering and railroad work environments and processes. I also produced the first commercial version of biomechanical software that is relied upon by NIOSH and that is widely used by American industry to evaluate and reduce low back injury risk.

On May 2, 2008 I visited the CSX repair shop in Selkirk, NY and examined the oil lube cooler replacement process, work environment, procedures, tools used, postures used for various activities, and ingress and egress from the locomotive in the area of the oil lube cooler. I also reviewed Mr. Duhart's deposition, the emergency room physician's patient file, the CSX incident report, the plaintiff's expert's report of findings, and photographs and measurements I made while performing an ergonomic assessment.

364 Patteson Drive #252
Morgantown, WV 26505
304-319-3003

877-ERGOTEK
wiker@ergotek.net

I have found that Mr. Duhart's assigned activities and those that he described in his deposition do not present risk of low back injury and that the job would be considered safe using the criteria established by the National Institutes for Occupational Safety and Health and by the occupational safety and health regulatory agency OSHA. In the following sections of this letter report I justify my conclusions and opinions.

Mr. Duhart believes that his incidence of low back pain developed as a result of performing his assigned task. His general hypothesis is that when he entered into the area of the repair in the locomotive machinery space, he shimmied about to get into position to attach a water pipe to the base of the oil lube cooler, and that activity injured his back. Workers often attribute development of stiffness or low back pain to the activity that they are performing at the time they begin to perceive such sensations. However, the time course for development of low back pain can range from immediate to approximately 72 hours after an excessive biomechanical exposure that results in tissue injury.

Your physician expert can address the bases for time-lags in low back pain (LBP) development for you in detail. However, it is a well-known challenge in the field of occupational biomechanics and epidemiology; fields that attempt to identify the origin and causality of LBP. Thus, while Mr. Duhart's LBP may have begun to present itself that day, it does not mean that his work activities on that day were causal, or responsible for exacerbation of an underlying subclinical pathos. Mr. Duhart's belief that his back pain was due to the activities that he was performing at the time of LBP onset is common and should not be interpreted as disingenuous on his part.

To determine if the job presented risk of low back injury (LBI) or LBP, one should examine the job to determine if lumbar spine mechanical stresses could exceed recommended safe limits for disc compression and muscle tension. Given the architecture of the locomotive machinery in the space where the oil lube cooler is located, it is impossible for Mr. Duhart to develop high mechanical stress within the lumbar spine region during ingress, performance of his repair operations, or with egress from the area. To perform any of the activities required in the oil lube cooler replacement while in the machinery space, Mr. Duhart and his coworkers have to rest their arms or torso upon adjacent machinery surfaces. Once those body parts are in contact with a rigid surface, the resultant forces and moments that are imparted to the body are transferred to the contact points. The machinery contact points become supporting elements and brace the body; thereby, significantly reducing the mechanical stress to the spinal segments. This situation essentially short-circuits and prevents transfer of such forces and bending moments from the hands or feet down or up to the spine respectively. The resulting forces acting upon the lumbar spine would not be related to the task at hand, and would be well below levels that are set by NIOSH as safe.

The low back is mechanically at risk when heavy loads are lifted away from the body. Using a teeter-totter analogy, the spine is the fulcrum or pivot point of a teeter-totter that has a very short board length for the spinal muscles to pull down upon, and a comparatively long board representing the lever-arm for the load in the hands. If one multiplies the hand force lever arm length by the perpendicular force, that produces a bending force that causes the teeter-totter to rotate downward. That downward rotational force (load moment or torque) has to be

countered by the magnitude of the muscle pull force that is multiplied by a short lever arm (the spinal muscles lie close against the spine). The greater the bending moment produced by the hand forces and body posture, the greater the spinal muscle force must become to counter the forward rotational forces. If the pulling forces become too large, they can pull the spinal segments (vertebral bodies) down upon the intervertebral discs to the extent that they mechanically yield (i.e., disc herniation) or the back muscles can be overforced and injured. If one stacks concrete blocks under the child at the end of a long teeter-totter, the blocks counter both the perpendicular force of the child's weight and the weight of the board and there is no rotational force or torque—resulting in the elimination of force needed on the opposite end of the teeter-totter to resist rotation. If the body is supported by leaning on equipment or when lying down, it is equivalent to stacking supporting blocks underneath the arms and torso to prevent the need for any material spinal muscle contraction.

An example of this is also provided by holding onto the steering wheel when driving an automobile for hours. If one tries to simply hold their hands out in space for a few minutes, they will develop musculoskeletal discomfort from the load moments within the arms, should and back. However, if one supports their arms by resting them upon the steering wheel, they can hold that position or perform that activity for hours without strain the elbows, shoulders and low back.

This postural support situation explains why Mr. Duhart did not identify any manual exertion producing experiences of stress or strain in his low back, and why he believes that the greatest stress to his back occurred when he was lying on top of the sheet metal housing of the drive shaft and moving about that surface. That activity would be similar to moving about or changing postures within one's bed at night and would produce minor levels of muscle activity. If his signs and symptoms were in the process of developing before he began the oil lube cooler, any movement of the torso while lying down could increase sensations of LBP or affiliated cues. The clinical community is well aware of discomfort that is experienced with simple postural adjustment or movements in bed by their low back pain patients. The discomfort experienced at those moments is not a result of excessive exertion or biomechanical stresses that are imparted to the spine; simply excitation of injured or irritated tissue.

The absence of unsafe biomechanical stresses to the lumbar spine also explains why Mr. Duhart, who reported in his deposition that he was well experienced with this operation and had performed the operation many times in the past without developing LBP or LBI, had not reported any perceived risk or hazard to his supervisors or the company in the past, or had experienced previous injury.

The oil lube cooler is so large and heavy that it must be handled by an overhead hoist and customized end-effector. This design and specification of customized equipment prevents exposure of workers to hazardous mechanical loads to the body. The design of the jig and procedures is evidence that an ergonomic and biomechanical hazard assessment had been performed by either the locomotive manufacturer or the railroad company, and that they acted in a responsible manner to reduce mechanical stresses to the spine to very safe levels.

The manual forces required in this task range from finger-turning of nuts on bolts, to operation of hoist control pendant buttons, to inserting the water pipe or hose to the cooler and finger tightening the fasteners for subsequent tightening by powered wrenches. These hand forces, even if the body was not in supported-contact with adjacent machinery, would not be adequate to produce unsafe biomechanical stress to the lumbar spine.

Mr. Duhart was trained in safe body mechanics for the purpose of preventing low back injuries, and he was empowered to report hazards and to refuse work activities that he believed were hazardous. This is consistent with OSHA and NIOSH recommendations for prevention or reduction of LBI and LBP incidence in the workplace. In addition to such training, all employees attended a daily safety briefing or meeting in which they were encouraged to point out any potential hazards or problems they experienced in the past or foresaw in the coming work day. Collectively, these efforts are consistent with those recommended by the federal government (NIOSH) for responsible and effective reduction in risk of LBI and LBP.

Mr. Duhart's expert, Mr. McCarthy, claims that the basis for the development of the LBP in this case was due to CSX's failure to comply with the OSHA Confined Space Entry regulations, failure to perform an ergonomic assessment, and Mr. Duhart's exposure to an "awkward" egress. I do not concur with Mr. McCarthy's claims for the following reasons:

- The oil lube cooler replacement was not performed in a confined space. The confined space regulations address entry of a worker or workers into a volume where breathable atmospheres may be absent or compromised, where toxic fumes, gases or entrapping material may exist, or where other hazards that affect the function of neuromuscular or cardiopulmonary systems, compromise a worker's consciousness, respiration or physical capacity to egress from that space. Confined space entry requires an appropriate combination of oxygen breathing apparatus, respirators, tethered body harnesses, compliance with appropriate medical first-aid and evacuation protocols, or use of other protective technology and protocols along with sufficient standby workers who will be able to remove the unconscious or noncooperative worker from the hazardous volume in a timely manner. Confined spaces are typically ship's holds, inside gasoline tank truck tanks; voids in buildings where vapors or gases can settle or where ventilation is absent; and other contained areas where breathing atmosphere or entrapping fluids or materials may exist and ventilation or egress are compromised.
- Mr. Duhart was operating in a well-ventilated area and has no risk of entrapment that would result in a confined space type injury or death. Mr. McCarthy either misunderstood the OSHA code of federal regulations, or misunderstood the nature of the job. I believe Mr. McCarthy should have inspected the worksite and job to develop a better understanding of the job and work environment. Had he done so I am confident he would have understood that the confined space regulations have no bearing on this activity, and that his conclusion that CSX had violated the confined space standards was without merit.
- Mr. McCarthy did not observe the process of entering into and exiting from the locomotive machinery space. Thus, he has no knowledge of that activity and concluded

that it produced excessive mechanical stress to the lumbar spine without any data or evidence. This is not an acceptable practice and violates the assessment procedures that are recommended by both NIOSH and OSHA and the draft guidelines for ergonomic assessments that he cited in his letter report. Had he observed the job and work environment, he would not have been able to show any analyses demonstrating hazard to the low back, or violation of any OSHA standards and regulations.

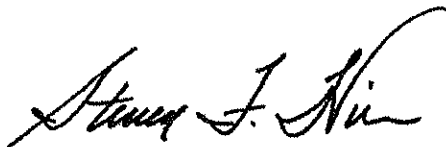
- Mr. McCarthy refers to the term “awkward posture” as a hazard that is addressed within ergonomic design guidelines. The term awkward is used throughout the ergonomic literature; however, its definition, impact upon the musculoskeletal skeletal system, and consequences are materially different depending upon the joint system and issue at hand. The definition of “awkward” posture for one joint is different than that for another joint. Ergonomic design guidance aimed at reducing risk of musculoskeletal injury recognizes that musculoskeletal injury risk is a multiplicative phenomenon that requires concomitant exposure to excessive postural excursions under high force with sufficiently frequent or long duration exposures that occur on a regular basis. The combined nature of postural excursions, levels of force, and exposure frequencies and durations, differs among body joints and regions. What is a hazardous exposure to the wrist can be an acceptable and safe exposure to the hip, knee, spine or other joints. The combination of these cardinal putative risk factors for musculoskeletal injury must be both concomitant and sufficient in magnitude. Like the fire triangle (heat, oxygen and fuel source are always required to produce a fire—eliminating one or more elements in the triangle prevents or extinguishes the fire), if one removes one of the three cardinal putative risk factors for musculoskeletal injury, risk of musculoskeletal injury is either eliminated or severely reduced to levels that are considered nominally safe by the federal government. Simply complaining about a worker’s description of “awkwardness” of a posture without measuring or observing the body mechanics, mischaracterizes the meaning and intent of ergonomic standards, regulations and guidance in this situation. Metaphorically, all verbal or written criticism is not slanderous simply because it is critical; one must meet specific criteria before it reaches the threshold of slander or deformation. “Awkward” movement of the joints is necessary to maintain joint health and safety and is ordered when patients cannot perform such actions, or, for example, during stretching exercises.
- While working in the locomotive machinery space may have made entry and exit time consuming and slow, the use of worker’s hands to support the body while entering into and exiting from the machinery space of the locomotive, resting the body segment’s upon or against fixed machinery components. The same was true when performing repair activities where workers rested upon the machinery when performing low-force manual exertions. Collectively these behaviors decoupled forces from postures and hands from that of spinal forces and moments. Moreover, the frequency of performing this task was rare, and the duration of the seated and lying postures was short in terms of hazardous durations and frequencies described by NIOSH in their low back injury prevention guidelines and standards. Collectively, this activity would not have exceeded NIOSH recommended combinations of postures, forces and frequency or duration thresholds for prevention of LBI and LBP.

In conclusion, my examination of Mr. Duhart's job, and review of his statements, indicates that the job is safe from the standpoint of LBI and LBP hazard. The company has effectively complied with federal standards and guidelines that address prevention of lumbar spine injury, and has performed both ergonomic assessments of this job and appropriate worker injury prevention training.

Mr. Duhart and his expert were unable to identify any activity that would have produced unsafe biomechanical exposures to the spine, and he had no material complaint about his supervision, or the equipment and tools provided (He suggested using shorter box wrenches during the initial securing of nuts to bolts and then exchanging the wrench for those he used when final tightening would be performed by torque wrenches. However, that would increase the mechanical strain on the hand and wrist system and would not have had any impact upon the mechanical exposures to the spine.). The National Institutes for Occupational Safety and Health would find this job, to a reasonable degree of scientific and engineering certainty, to be safe from the standpoint of LBI and LBP hazards. I concur with that conclusion.

I reserve the right to review and assess any new information that is provided to me and to modify my opinions in compliance with the most recent standards, guidelines, and engineering and scientific principles related to this matter. If you have any questions, please contact me at your convenience. I have attached under separate cover a list of measurements made, and photographs of the machinery space involved in this matter.

Sincerely,

A handwritten signature in black ink, appearing to read "Steven F. Wiker". The signature is fluid and cursive, with the first name "Steven" and last name "Wiker" clearly distinguishable.

Steven F. Wiker, Ph.D., CPE

Encl: 1. Photographs and measurements taken during the site inspection and job assessment.